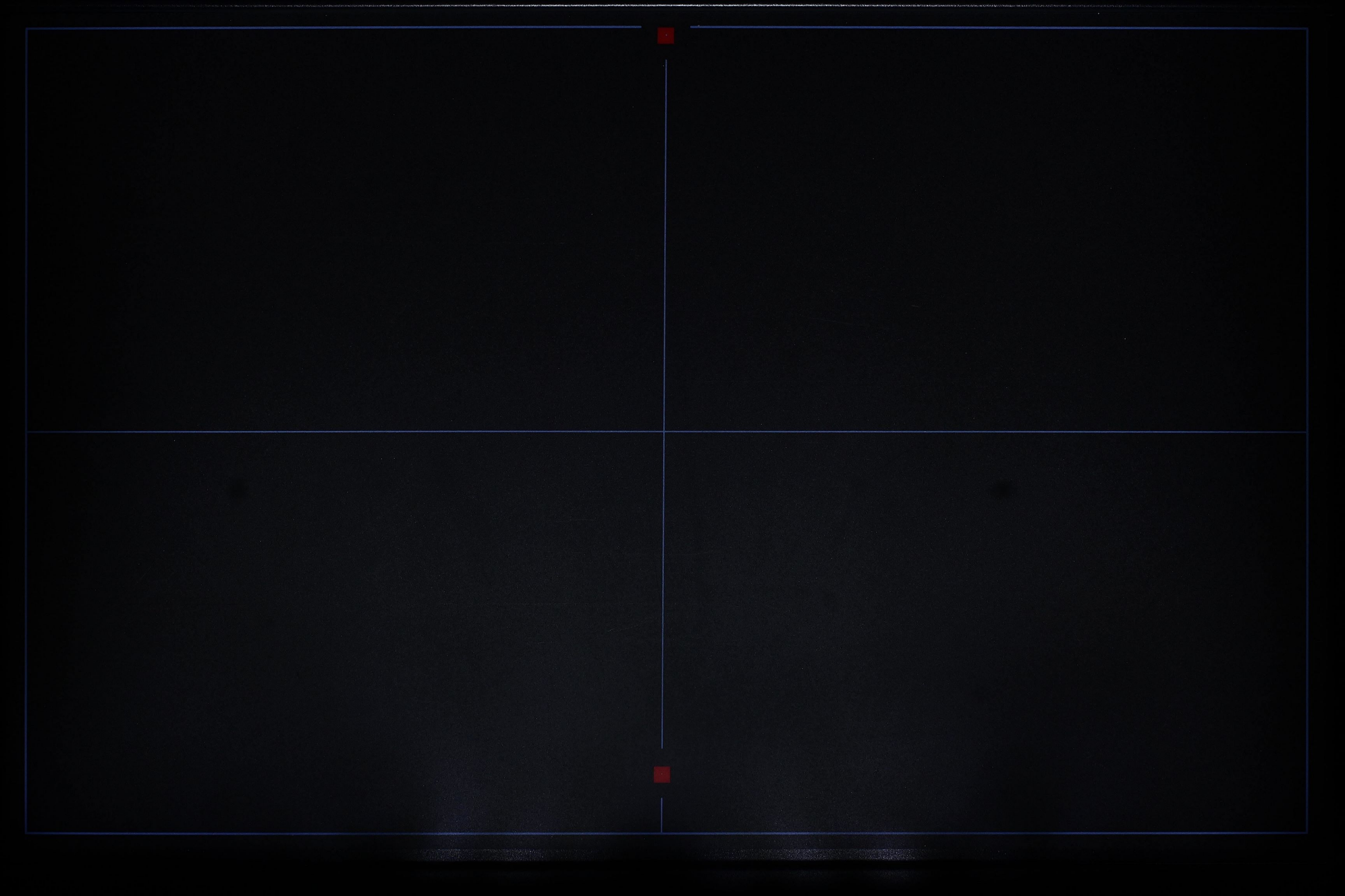
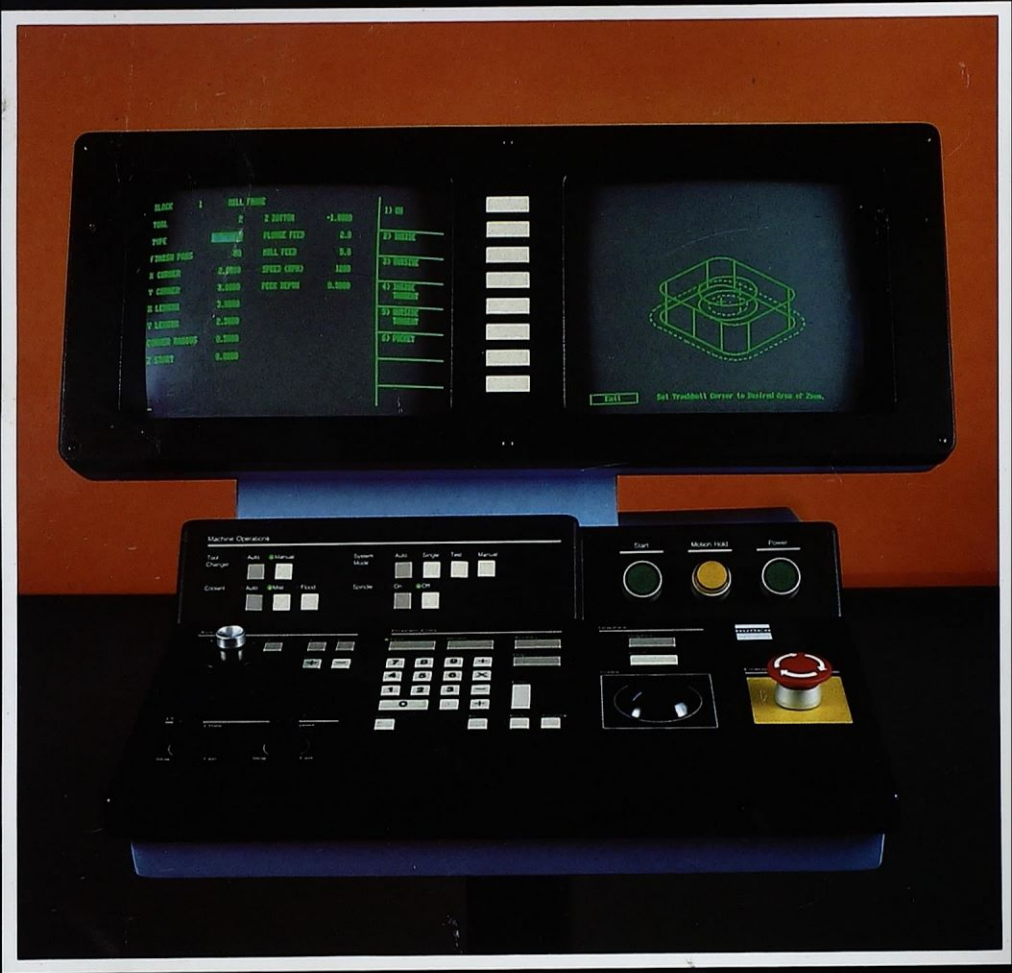


Ultimax.



Ultimax.

A Letter to Our Customers

In 1976, Hurco introduced conversational programming to the machine tool industry. Our B-series control brought practical, useable CNC to small job shops and large manufacturing companies engaged in short-run production all over the world. The B-series helped establish Hurco as a world leader of CNC vertical machining centers. Today, Hurco machines are working in hundreds of shops and companies throughout America, England, France, Germany, Switzerland, and other countries around the world.

So why Ultimax? Why attempt to surpass what today is still the easiest CNC control to program in the industry? Because today's rapid advances in technology mean we are capable of bringing you more power, more simplicity and more flexibility.

As a leader, you get followed . . . and we're no exception. Today, you read a lot about conversational programming, menu selection, question-answer and user-friendly software. We're flattered that other manufacturers have found our ideas worthy of imitation. But unfortunately, many so-called conversationally programmed controls are really just compromises using complex traditional programming techniques. While ideas have been added to our foundation, many controls have simply fallen short on simplicity. And they're just not designed for the short-run manufacturer. We were interested in providing you with better solutions for your applications.

We wanted to give you increased programming power. And we didn't want to sacrifice the simplicity. Ultimax provides all three . . . power, simplicity, flexibility.

Today, more than ever, the industry needs versatility. Dependable versatility. Because of the high development cost to the manufacturer of CNC controls, there is often a tendency for the control to be all things to all people. Consequently, many controls disappoint the very people they were designed to help. Our number one objective was to design for the short-run manufacturer, the most powerful, yet simplest-to-program control in the industry. And we wanted to insure that the power could grow with you, at your rate, protecting your investment for the life of the machine.

The "where to program" debate often places you in a dilemma. Should you use existing operators or hire a programmer? Should you program in the office or at the machine? Is "at the machine" programming right for everybody in every situation? And once you make up your mind, does that set a course for your company that you can't change?

Our answer to that last question is "No." Ultimax effectively gives you two controls in one: The unmatched simplicity of our expanded conversational programming, or the features of our conventional machine code programming. You choose whatever suits your needs. And if your needs change, your choice can too with Ultimax.

Another Hurco design objective was world class reliability. We design and manufacture both software and hardware, providing single-source dependability. During the three-year development of Ultimax, we've utilized proven state-of-the-art technology in design, while adding to our manufacturing facilities the latest computerized inspection equipment to insure rigid standards of quality control. We added features like self-instruct messages, and self-diagnostics. And Hurco's maintenance training school is ready to serve you. Hurco gives you the opportunity to service your machine electronically with the same independence you've historically had servicing the mechanical portion of your machines.

Hurco began in 1968 with a commitment to the short-run manufacturer. From providing you with reliable, useable, expandable technology to insuring that your productivity levels keep you competitive worldwide, we want you to be able to meet the needs of the future. Ultimax is the result of our continuing commitment to you. Behind it are more years of experience with conversationally programmed controls than anyone else in the industry. We hope you'll take the time to read about some of the exciting features of our most recent research reward.

You presented the needs. Ultimax is our response.

The Employees of
Hurco Manufacturing Company

The Power and Simplicity of Ultimax.

Finally. A CNC control that lets you have it all. Ultimate power with maximum simplicity. The ultimate in CNC control. Ultimax.

- **Easier conversational programming.**
- **Dual Screens with full graphics.**
- **Self-instruct help messages**
- **Self-diagnostics**
- **Concurrent programming**
- **Easy interface with other systems**

All the power for programming today's parts, as well as the parts you may need in the future.

All the adaptability for programming at the machine as well as in the office.

All the simplicity needed by the short-run user.

All the power required for longer production runs.

Hurco pioneered conversational programming. Ultimax redefines the ultimate in user simplicity.

Six Main Control Sections

1. **Two 12-inch CRTs and Softkeys**
   The left screen is devoted to data entry of tool setup, part setup, and part programming. The screen displays logical choices for setup and programming, highlighting the features to be programmed. Programming can be accomplished through the menu selection of soft-wired keys between the screens or by using the simple numerical keyboard.

   During part programming, the right screen automatically creates a graphic display of the part geometry. The right screen also provides comprehensive help messages when desired by the operator.

2. **Program Entry**
   This section of the control provides three main functions: easy data input through a simple calculator keyboard; a quick way to review the program for editing, and the selection of auxiliary functions. The auxiliary key provides interface with our DC100 magnetic tape cartridge and external factory automation devices.

3. **Trackball Cursor Control**
   The trackball cursor provides fast selection and manipulation of graphic features. Placing the cursor over any area of the graphic display automatically locates the data block used in programming that feature.

   The trackball also provides easy alpha character selections which may be used in some optional software packages.

4. **Machine Operation**
   Simple key and pushbutton selections allow easy machine control with indicators clearly marking the mode selection. This section initiates control in tool changer, coolant, spindle and axis drive systems, and also provides power for starting and stopping the machine.

5. **Axis Jog and Override Control**
   The axis jog control provides convenient manual operation of each axis during setup in the manual mode. During the machining of the first part, the feedrate overrides may be adjusted for optimizing productivity. During the use of these adjustments, the control permits automatic editing of the originally programmed feeds and speeds.

6. **DC100 Magnetic Tape Cartridge**
   The DC100 has 240k bytes of magnetic tape storage. This read/write cartridge system has two major functions: part program storage and initial loading of executive software. Adjacent to the cartridge location is a keylock switch which prevents any basic change in the program. Each cartridge can store up to 56 programs and handles the equivalent of over 6,000 feet of paper tape.

   Ultimax provides two RS232 ports for data transfer with external devices.

Ultimax graphics shown here with isometric graphic display.

Ultimate Power.

Dual Screens—Information without Confusion

Left Screen
The left screen is an 80-character, 24-line display, devoted to data input for part setup, tool setup, part programming, programming parameters and programming of auxiliary functions (program storage and retrieval using magnetic tape). It also displays machine position, program status, and axis load monitoring during machine operation. The lower portion of the screen provides self-diagnositc messages, indicating errors during programming or running.

Ultimax software prompts the operator through all the programmable screens. The display highlights the next logical choice in the programming sequence. The operator responds through the use of 8 softkeys which provide easy menu selection or data input through the numeric keyboard.

Left screen displays are designed to provide you with the quickest and simplest way to enter a minimum amount of data and still achieve automated machining of the part.

The innovative use of Hurco's question-answer technique allows you to choose additional programming power when you need it. Definition of safety zones and modification of program parameters are only two examples of this available programming power.

Program parameters, which specify finished stock allowance in two-pass milling, retract clearance for tools and rapid traverse rate, and more, can be easily modified from the assumed values whenever part conditions require.

The review key provides an instant summary of the data blocks, type of operation and tools used, to permit easy reviewing of the machining sequences used in programming. These specific data blocks can be called up to examine any particular portion of the program for further editing.

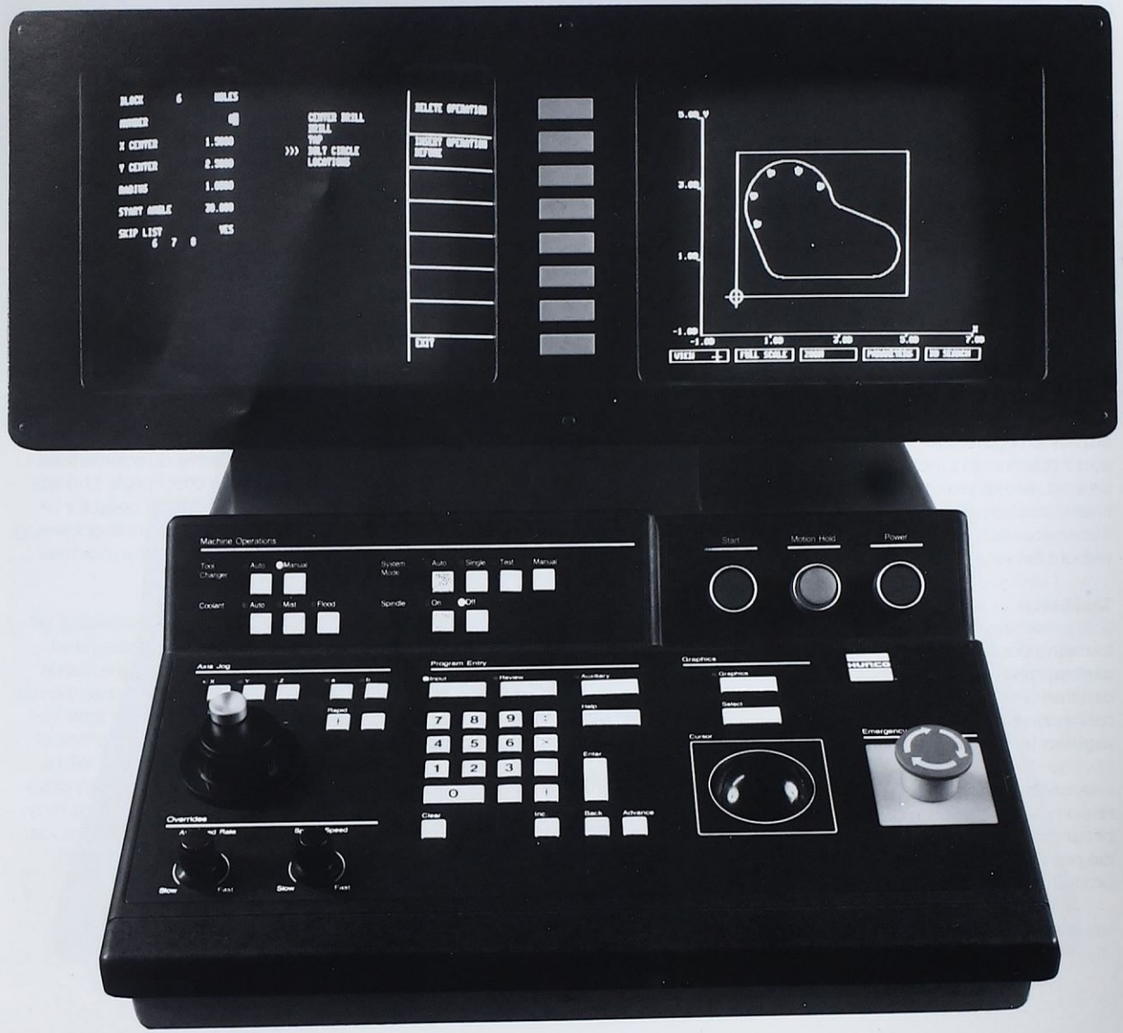
The keylock switch on the right side of the control console disables keyboard access to the control memory, preventing further keyboard entry.

Right Screen
The right screen is devoted to full graphic display, comprehensive help messages and optional software program features.

Graphics
Ultimax high-speed graphics automatically draw the part while the operator is programming it on the left screen. The operator can select three different 2-D views, a 3-D isometric display, or all four views at the same time. Two-dimensional numerical scales can be imposed to help the operator verify the appropriate location of part features. The zoom feature allows magnification of all or any section of the part.

Features on the right screen are quickly selected with the trackball cursor control. If the operator sees that he has incorrectly programmed a portion of the part, the cursor can be quickly located over the mistake in the graphic display. The appropriate data block is automatically retrieved and displayed on the left screen, ready for further editing.

Help Messages
Comprehensive help messages are displayed on the right screen whenever the HELP key is depressed, reducing training time and providing greater versatility in the use of machine operators. The messages are specifically related to the setup or programming activity in use on the left screen. These messages explain: the functions of appropriate keys; the proper sequence of events in the programming, and, in some cases, a graphical representation of the activity being developed by the operator.



Graphics are displaying the part as it is being programmed. The hole patterns are being added.

Maximum Simplicity.

Easy Machine Operation

User-friendly machine controls, quick setup procedures and programming power. Ultimax combines all three to maximize machine operation simplicity.

Part Setup
The part can be located anywhere on the table, and through the use of convenient jog controls, the spindle can be quickly centered over any portion of the part to be considered "zero" as it relates to all other programmed part features. After finding part "zero," pressing the appropriate softkey during setup will cause the display to register the appropriate X and Y offsets from machine zero. If the desired zero reference point is already known from a previous run, the offset dimensions can be merely keyed in without the setup procedure.

Tool Setup
Tool presetting is eliminated by simply lowering each tool to touch off the desired reference plane on the part or fixture. Pressing the appropriate softkey during this tool setup mode registers the Z position for each one of up to 99 tools. Previously known reference points or modifications to reference points can be directly programmed without going through the physical tool referencing procedure.

Axis Jog and Override Control
Key selection of the appropriate axis energizes the servo motor for manual jogging into the desired position. A convenient hand wheel will cause that particular axis to move in the desired direction. During jogging, the axis position is displayed to the nearest .0001".

The extremely fine resolution of this manual positioning wheel would cause the jogging task to be unnecessarily tedious on most machines. Ultimax has a variable resolution which can be increased or decreased using the feedrate override knob. This allows the operator to select the appropriate resolution for the positioning wheel, allowing him quick and accurate positioning of the machine.

Two override knobs are provided—one changing the feedrate of each axis, and the other dedicated to change of spindle RPM.

In many cases, it may be desirable to optimize specific feed and spindle speed rates from those initially programmed. This can be done by using the override controls, pressing an entry key and automatically changing the previously programmed speed and feed rates. This feature requires copying of the program and transfer into the concurrent programming memory where it can be automatically edited.

Run Status Display
During the machining of a part, the left screen will display the simultaneous positions of three axes, tool number in use, spindle speed and feedrate. It also displays three bar graphs, indicating the percent load on each of the three positioning axes. This feature optimizes the use of the machine tool while preventing overload conditions which might damage long-term life.

Concurrent Programming
The powerful multi-microprocessor architecture of Ultimax allows the operator to run the previously programmed part while programming a completely different one. Many parts with longer run cycles permit the operator to have adequate time in programming other parts. This will frequently eliminate the need for off-line programming while still achieving maximum utilization of the machine tool.

During concurrent programming, all of the powerful programming and graphic features are fully available. The operator can flip back into the run mode to check status at any time he desires, without losing any portion of the part being programmed. While programming in this mode, any diagnostic warning messages, which may be appropriate during the run mode, will also appear on the left screen.

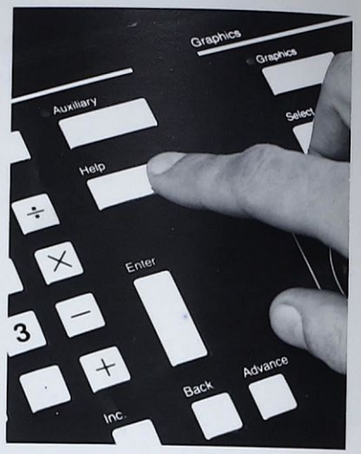
Operator assistance messages are shown here on the graphic screen.

Programming Simplified.

Teaching

Ultimax greatly reduces training time through a unique combination: programming by prompting; allowing the operator to see what is being programmed through the use of dual screens; providing comprehensive HELP messages; generating understandable diagnostic messages during programming and operation. This powerful combination is further enhanced by a simplified console keyboard to make easily understood choices.

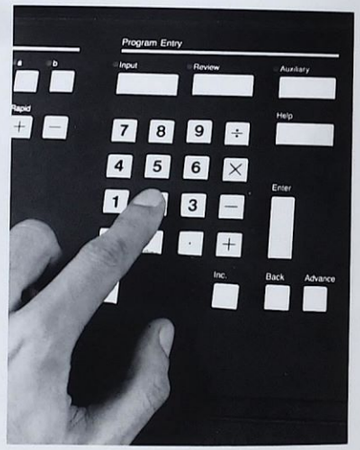
But Ultimax also retains its capability to handle complex parts and optimize the run time for parts made in larger quantities. When entering data, the operator presses the INPUT key and the left screen displays only the appropriate choices for setup and programming. If the statements on the menu need further explanation, the HELP key is pressed, producing on the right screen comprehensive explanations of the activities currently selected on the left screen. When the HELP message is too extensive for display on one screen, a menu of the message type is displayed on the right screen for selection by the trackball cursor. The screen then displays explanations for that particular function.



Programming

Ultimax greatly simplifies programming of even complex parts.

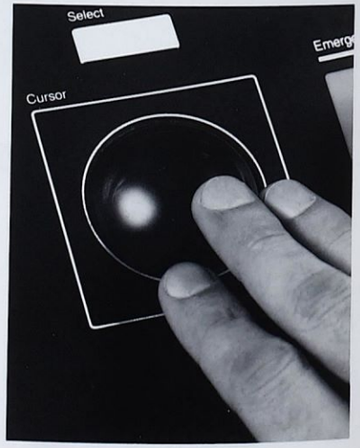
1. A blinking cursor leads the operator through the logical programming steps.
2. Eight softkeys allow quick menu selection of choices related to the programming activity.
3. While the operator programs, the part is simultaneously drawn on the right screen.
4. The number of data blocks are dramatically reduced by grouping a number of similar activities into one data block.

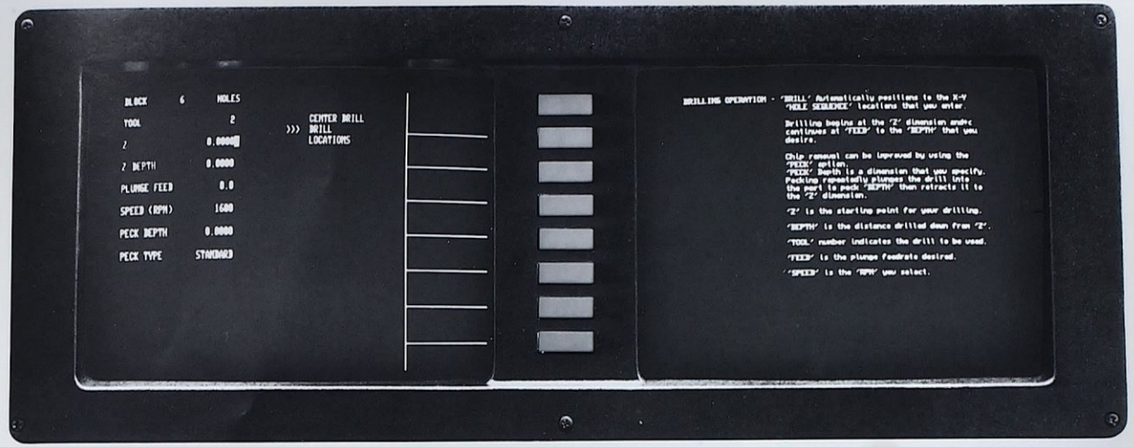


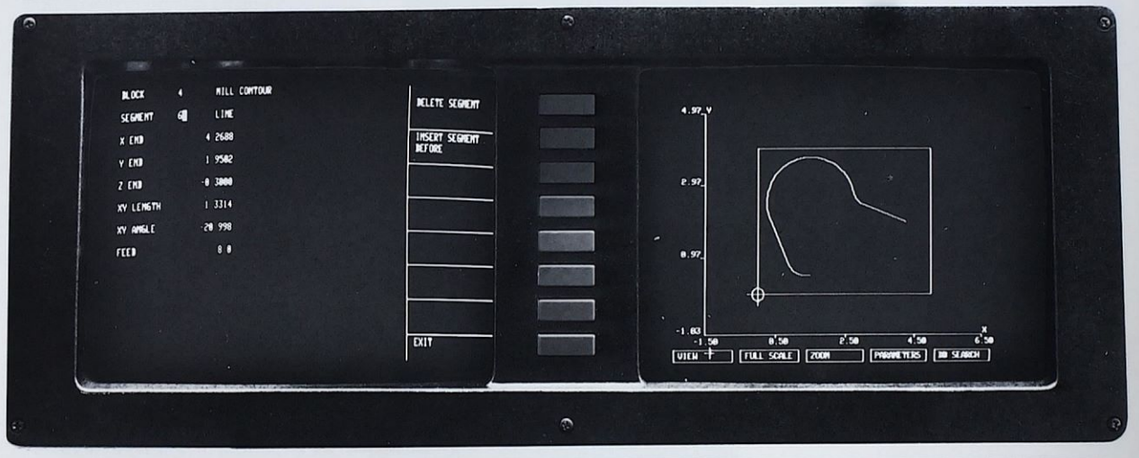
Editing

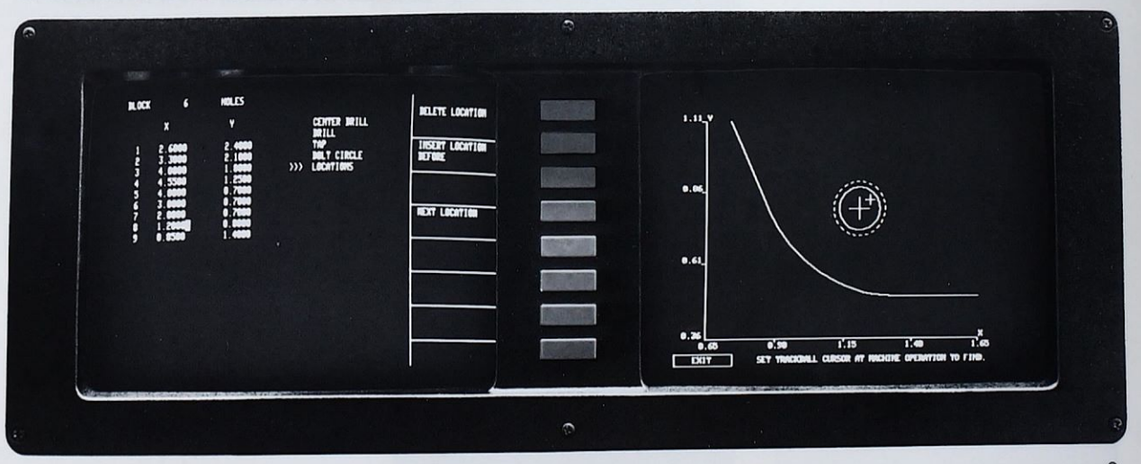
Ultimax provides unmatched ease in editing a program. After the programming is completed, a review key provides a quick summary on the left screen of all the data blocks, the type of activities programmed in these blocks and the tools used. This eliminates the tedious searching of various data blocks to find the portion of the program where change is desired.

During the programming, the graphics on the right screen draw the part as it is being programmed. Graphic menus are selected by a trackball controlled cursor to provide any one or all of front, side and top two-dimensional views or a 3-D isometric view. The graphic display may be selected to draw part outline or tool cutter path. Visual inspection of the graphic display may indicate that a programming error has been made. The trackball cursor can be placed over the area in question and the automatic data block locator immediately displays the appropriate portion of the program on the left screen, ready to be corrected.




BLOCK 6 HOLES
TOOL 2
Z 0.0000
Z DEPTH 0.0000
PLUNGE FEED 0.0
SPEED (RPM) 1600
PECK DEPTH 0.0000
PECK TYPE STANDARD
CENTER DRILL
DRILL
LOCATIONS
DRILLING OPERATION - 'DRILL' Automatically positions to the X-Y 'HOLE SEQUENCE' locations that you enter.
Drilling begins at the 'Z' dimension and continues at 'FEED' to the 'DEPTH' that you desire.
Chip removal can be improved by using the 'PECK' option.
'PECK' Depth is a dimension that you specify. Pecking repeatedly plunges the drill into the part to peck 'DEPTH' then retracts it to the 'Z' dimension.
'Z' is the starting point for your drilling.
'DEPTH' is the distance drilled down from 'Z'.
'TOOL' number indicates the drill to be used.
'FEED' is the plunge feedrate desired.
'SPEED' is the 'RPM' you select.





Simplicity and Speed.

Typical Programming

Part Setup

Pressing the INPUT key brings up a display with a menu providing selection of part setup, tool setup, part programming and program parameters. Softkey selection of part setup provides the display shown in the example. During this display, the table may be positioned for calibrating part zero, and a safety work region may be programmed if desired. If the zero position for the part is known from a previous run, XY part reference dimensions can be programmed. Definition of the safety region aids in the prevention of collision with a vise or fixture for the work, or accidentally drilling into the table.

Tool Setup

Softkey selection of tool setup provides the screen shown in the example, which permits up to 99 tools to be programmed and calibrated. Use of automatic determination of speeds and feeds requires the operator to additionally program the types of cutter and cutter material, and the type of material to be machined. As each tool is defined, the jog controls permit the tool to be quickly lowered to the reference point and individually calibrated. This calibration can also be dimensionally specified if tool length is previously known.

Part Programming

After pressing the INPUT key, PART PROGRAMMING is selected. This provides the primary choices of positioning, holes, milling and patterns. A blinking cursor leads the operator through the logical sequence of activities in programming the desired type of operation. The unique data block structure permits grouping of operations having a common tool or part location, greatly simplifying and reducing the number of data blocks and individual displays.

The data block formats are designed to allow simple work to be programmed with the least amount of key strokes. These display formats also provide easy access to many powerful subroutine menus, permitting easy programming of machining operations. In the example, the programming of a bolt circle requires one data block, including the deletion of holes within the bolt circle.

Program Parameters

The powerful subroutines, which greatly reduce the data input in programming complex machining sequences, typically have parameters with standard values such as finished machining allowance of .010" for two pass milling of circles. These values can be quickly changed to meet specific requirements by calling up the two displays of program parameters.

Quick Programming

Jog table to find the XY zero for the part and press zero reference softkey.

Load center drill in the spindle and jog down to touch off the top of the work. Press tool reference softkey for calibration. Enter in the spindle speed. Repeat this sequence for a drill and the appropriate tap. Entering the pitch number of the tap will allow the computer to automatically determine speed and feedrate when tapping with that tool.

Select softkey for holes. Successively enter tool number, tool type, Z-start and Z-bottom for the center drill, drill and tap operations. Select softkeys for locations and bolt circle. Program diameter, starting point from three o'clock, number of holes and hole numbers to be omitted from the bolt circle.

Changes normally are not required from assumed values.

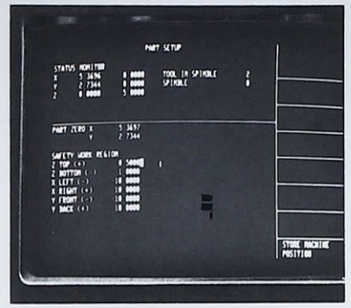
Complex Part or Longer Run Programming

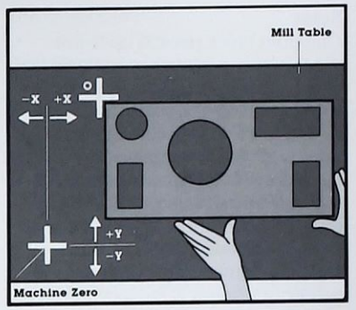
Select material type if subsequent requirements for automatic determination of speeds and feeds is desired. Safety zones may also be programmed above, below, or around the workpiece to prevent the possibility of tools crashing into projections, work holding devices or the table.

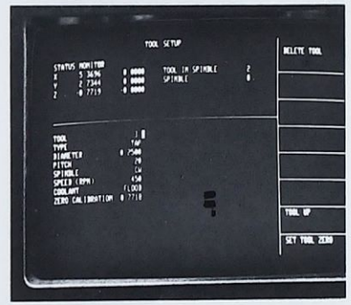
To utilize automatic selection of speeds and feeds requires the programming of type and material of the cutting tool to be used. Selection of flood, mist or no coolant for each tool can also be made.

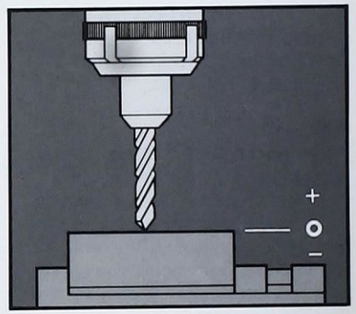
No additional requirements.

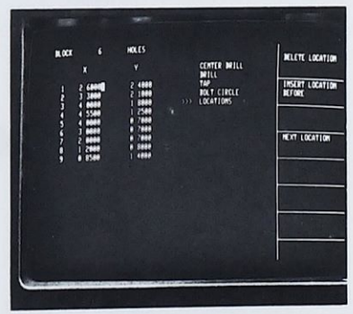
Optimizing of part accuracy and/or run time may be improved by changing parameters such as pocket overlap, finish allowance and rapid traverse speeds and dwell times.







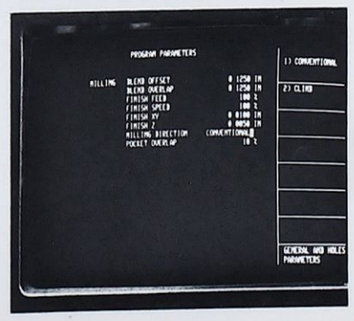


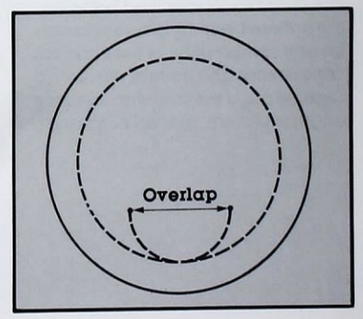


Top illustration: Part zero can be established anywhere within the table travel.

Middle illustration: Easy tool referencing allows programming directly from print dimensions.

Below: On pocket mill operations, the cutter path to the pocket wall is automatically blended by the computer, eliminating cutter dwell marks.





Easy Solutions to Tough Problems.

Over 20 Subroutines Designed for Maximum Efficiency

Holes
One data block permits up to five successive machining operations which have common Z-depth and XY locations, such as drilling, tapping or boring to be specified. Successive screens define tool number, Z-start, Z-bottom and all other related Z-axis requirements. If spindle speeds, tap pitch and coolant conditions have been specified to the tool setup, they will be automatically inserted in the program whenever the tool number is called up. Subsequent location screens permit multiple grouping of hole locations related to the data block specification of Z-axis tools and conditions.

Milling
With one data block, any sequence of connected lines and arcs or other milling subroutines can be programmed by defining the tool, initial XY entry point, Z-start and Z-bottom dimensions, feedrate(s), and the subsequent location of XYZ points defining lines and/or arcs.

Other milling subroutines available include automatic two-pass, rough and finish machining for any XY linear or contour; 3-axis linear and contour milling and automatic blending of arcs.

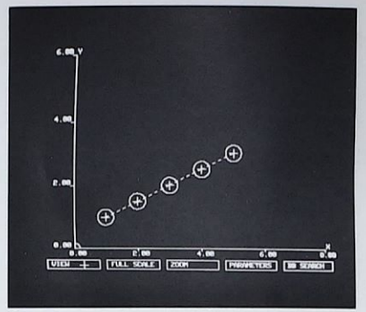
Patterns
These subroutines allow the development of macro-routines to be enclosed between a data block identifying the start of a pattern and a final data block determining the end of a pattern. The data blocks specified between the pattern beginning and end can be any combination of hole and milling routines. The pattern can then be repeated in a rectangular, linear or angular pattern, placed in an angular position or rotated. A pattern may be repeated up to 250 times on each axis and up to four consecutive loops and repeats of the pattern can be made. In addition, patterns may be scaled up or down in X, Y and Z or mirrored.

Copy or Move Blocks
A consecutive sequence of data blocks can be identified and moved to different coordinate positions. After moving a series of data blocks, the pattern routine can also be applied to it, permitting it to be located at different angles. This feature can also be used to reorder complete machining sequences within a program in order to optimize the program run-time, accuracies and/or surface finish.

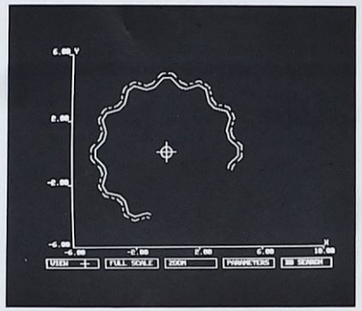
Cutter Compensation
This permits tool diameters to be programmed in the tool setup procedure and automatically allows the desired finished part contour to be programmed without regard to the tool size. The tool can be subsequently sharpened to a smaller diameter or changed to a different size without changing the program. The subroutine has look ahead features permitting machining of very sharp, acute angles on the outside or inside.

Odd Pocket Cleanout
This permits the automatic milling of all areas inside a closed contour of any shape.

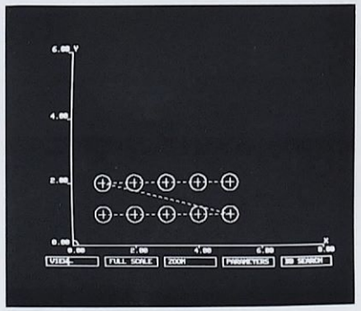
Face Mill
By specifying a single corner of the rectangular area to be face milled, together with the length and width of the rectangle, this subroutine automatically mills the defined area using bi-directional or uni-directional cutter paths. The uni-directional cutter path can be chosen using either climb or conventional milling.



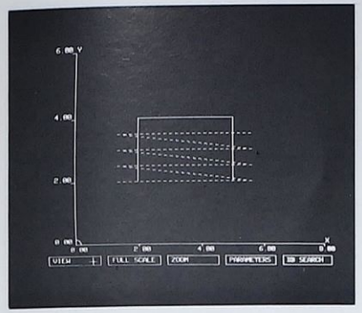
Linear Pattern Repeat



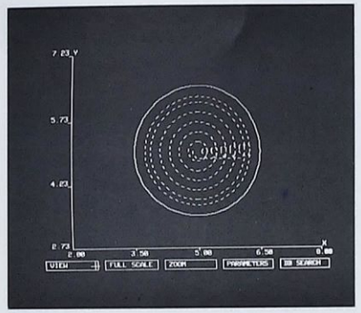
Rotational Pattern Repeat



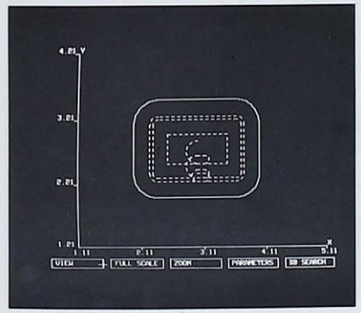
Rectangular Pattern Repeat



Uni-directional Face Milling



Circular Pocket Milling



Rectangular Pocket Milling

Pocket Milling
With a single command, Ultimax will automatically clean out circular, square, and rectangular pockets. An arc-shaped cutter path is automatically blended to the pocket wall so that cutter dwell marks are eliminated.

Frame Milling
Square or rectangular frames may be milled in one data block by specifying the XY coordinate of the lower left corner of the frame, together with its length and width. A radius may be specified for the four corners, together with whether or not the frame is to be machined with the cutter inside or outside of the specified dimension. Additionally, if pocket mill is specified, the interior of the frame will be milled out completely.

Circle Mill
The circle mill subroutine permits milling of a circle by specifying the XY center of the circle together with the radius. The cutter can be located either inside or outside of the finished dimension, and, as with the frame mill, may be pocketed automatically with a single command.

Helix
The helix subroutine permits machining of helical forms in a single data block. This subroutine is especially valuable in machining internal or external acme threads on machined parts.

Boring
Ultimax provides for three separate routines including standard boring, rapid retract boring and tool stop and retract boring cycles. Each of these may be specified in a single data block.

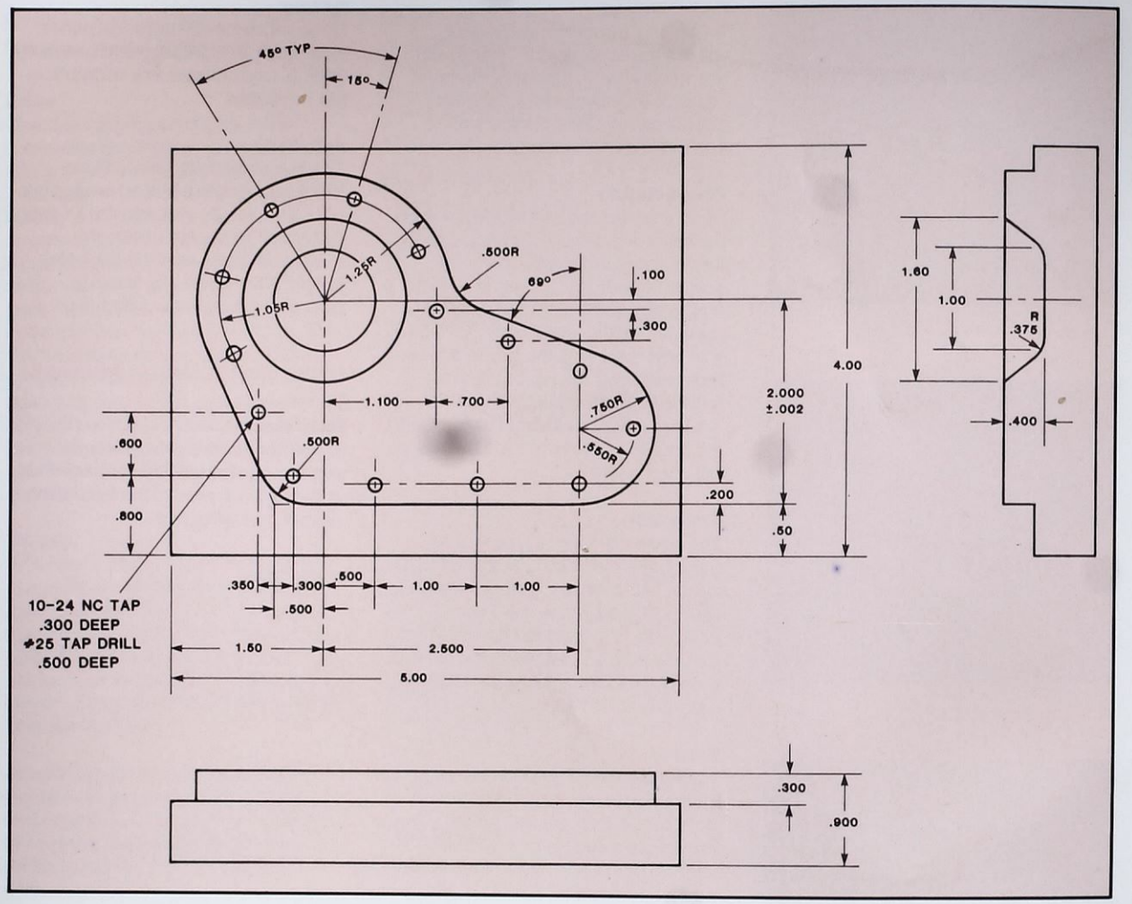
Drilling
Three separate drilling subroutines, including peck drilling, chip breaker drilling, and counter-sink subroutines are available.

Bolt Circle
The bolt circle subroutine allows automatic drilling, boring or tapping of bolt circles. By defining the XY center of the bolt circle, the radius, the number of holes, and the first hole location, the operation is easily accomplished in one data block.

Additional Software features

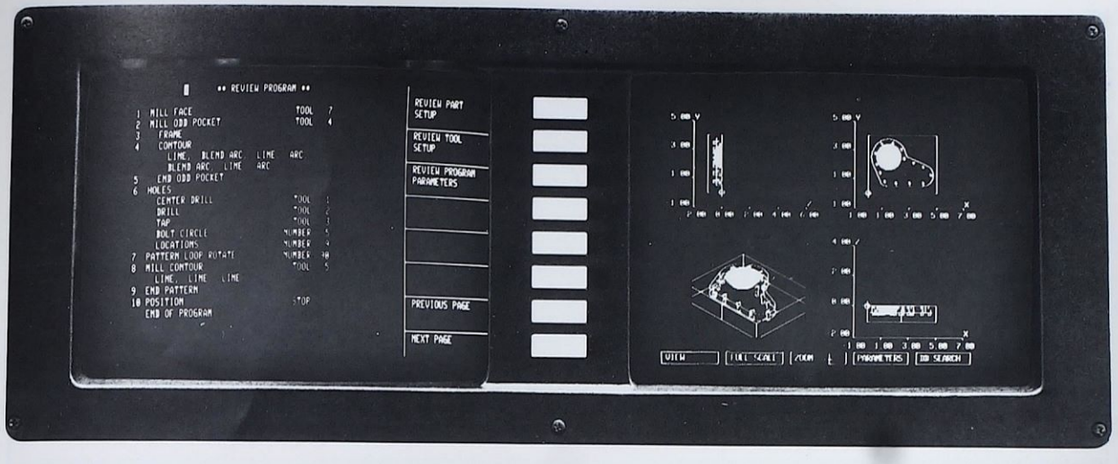
Inch/Metric
Programming may be entered in either inch or metric dimensions. This choice is prompted at the beginning of each new program.

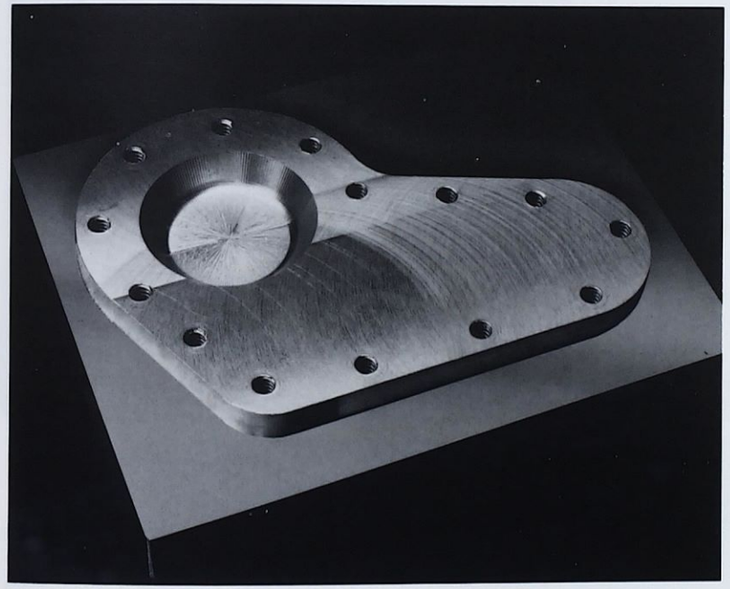
From Drawing to Part in Only Nine Data Blocks.



The dramatic reduction of data blocks necessary for Ultimax part programming is illustrated on the following pages.

A part which could easily have taken over 100 data blocks to program takes only nine, resulting in phenomenal programming time reduction for the operator. Ultimax power and simplicity results in ultimate machining efficiency.





Reviewing the Programmed Part

In the midst of perhaps hundreds of data blocks typical to conventional CNC, trying to find a particular tool or dimension to be programmed is extremely tedious. The unique data block structure of Ultimax provides a simple way to quickly review the program without the hassle.

Pushing the REVIEW key brings up a screen which numerically lists the data blocks programmed, the type of operation in each block, the number of operations within each data block and the tool number(s) used for each data block. It also lists the number of times a pattern may be repeated. By greatly reducing the number of data blocks, the operator can go directly to the INPUT mode and immediately find that data block and its respective operation which may need to be corrected.

In conjunction with the graphic display of the completed part, the review screen greatly aids in quickly locating the details of any portion of the program, even on complex parts.

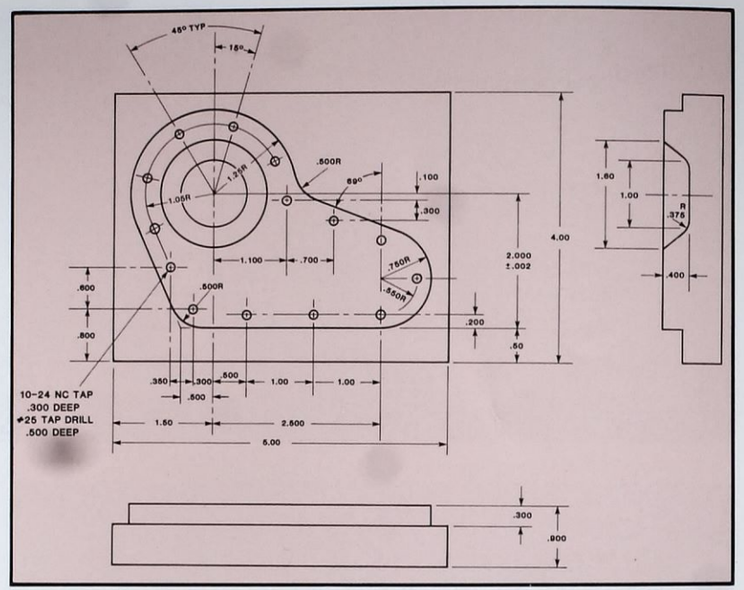
Milling in Two.

Milling for the example part was programmed in only two data blocks, compared with over 25 typically needed in conventional CNC programming.

The first data block was used to automatically face mill the top of the part, with a 3" cutter, using a bi-directional face mill subroutine. After selecting milling, a new menu provided face mill as one choice among many milling subroutines.

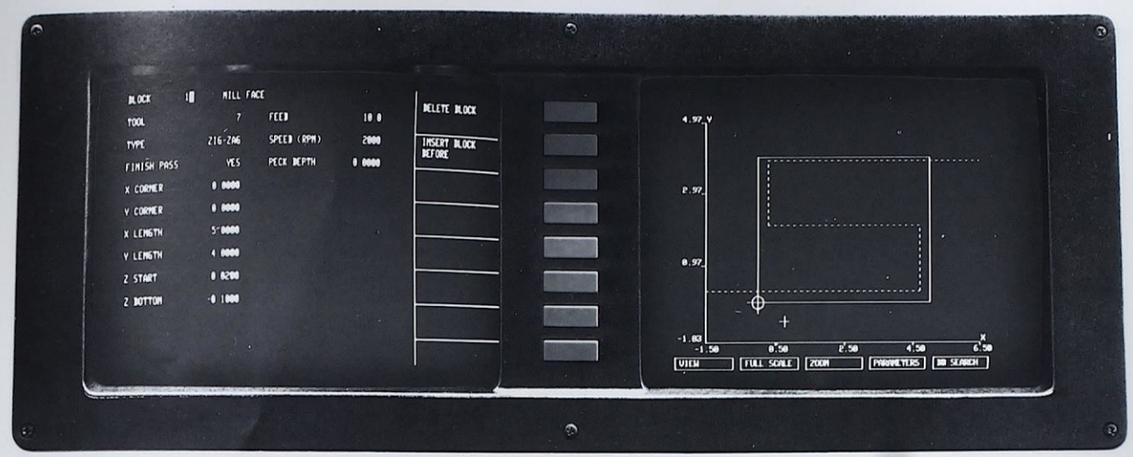
Data Block 2 initiated the start of outside odd pocket cleanout, permitting the specification of the outside closed contour of the bellcrank shape. One screen for each segment of the shape was required to define the lines and arcs. By programming only the available blueprint dimensions, such as radius, angle and centerline locations of radii, No-Calc automatically calculated all of the necessary points of tangency, without any operator intervention.

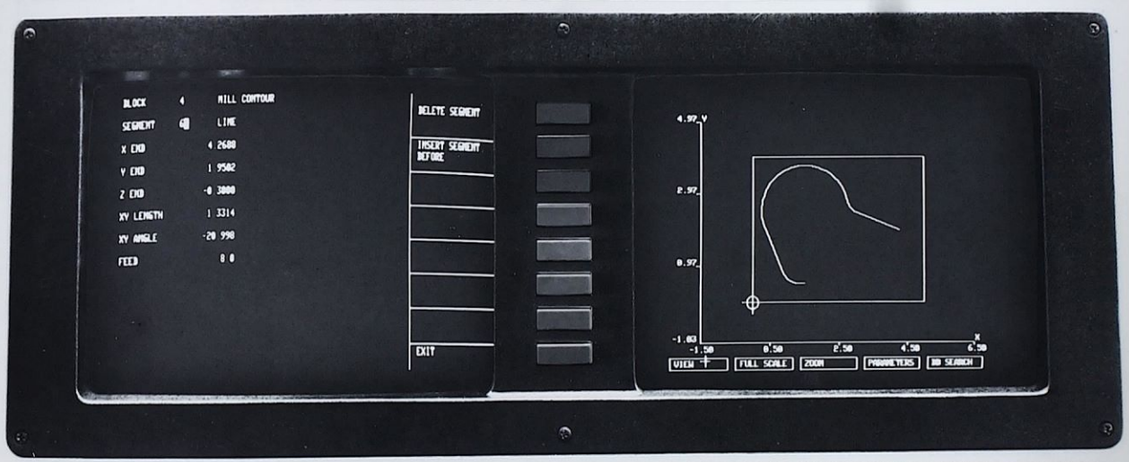
The right hand screen during the face mill shows the centerline of the cutter path over the part. The graphic display for the odd pocket cleanout, however, displays the finished part contour. The choice of cutter path or part contour can be selected from a menu by the trackball cursor.

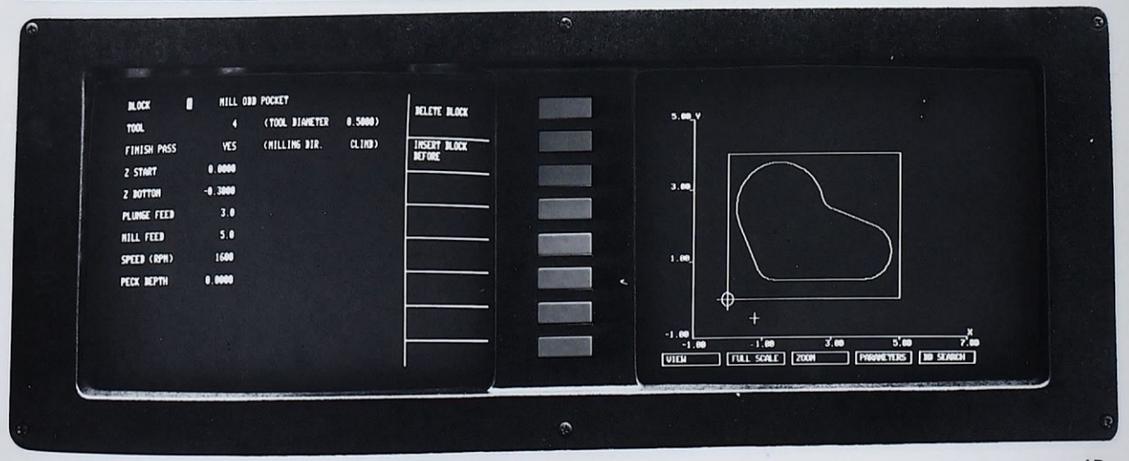


No-Calc Programming

When using milling subroutines in defining intersecting lines and arcs, the No-Calc feature will allow any combination of dimensioning related to starting points, blending points, angles or radii to be programmed directly from the part drawing, without requiring the operator to do any calculation. For this feature to work, the drawing dimensions must be sufficient to provide a mathematical solution.







Holes in One.

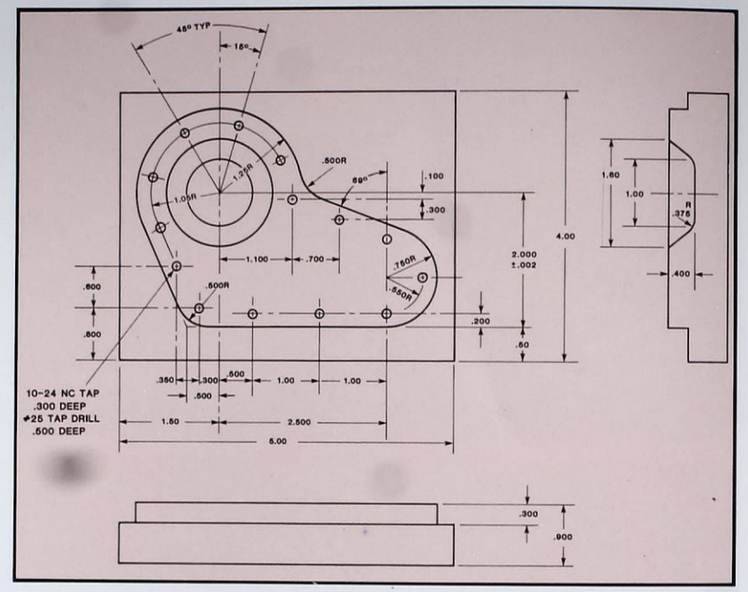
Center drilling, and drilling and tapping of 14 holes required only one data block. Three screens in the data block defined all of the Z axis conditions for each of the three tools used.

Segment one utilized a bolt circle subroutine for programming five locations. Specific holes can be easily omitted from the bolt circle subroutine, as noted in the example.

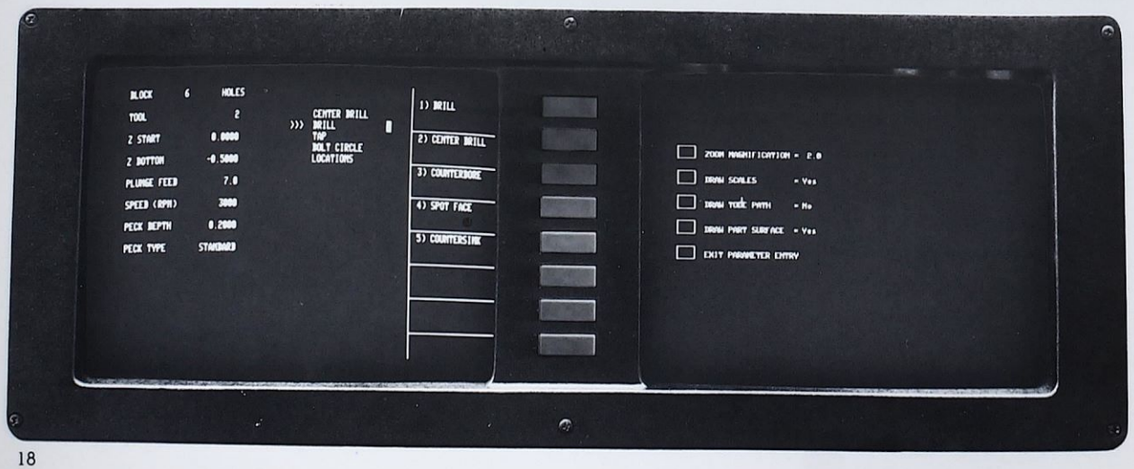
The second segment permitted the nine randomly located hole locations to be programmed and shown on one screen.

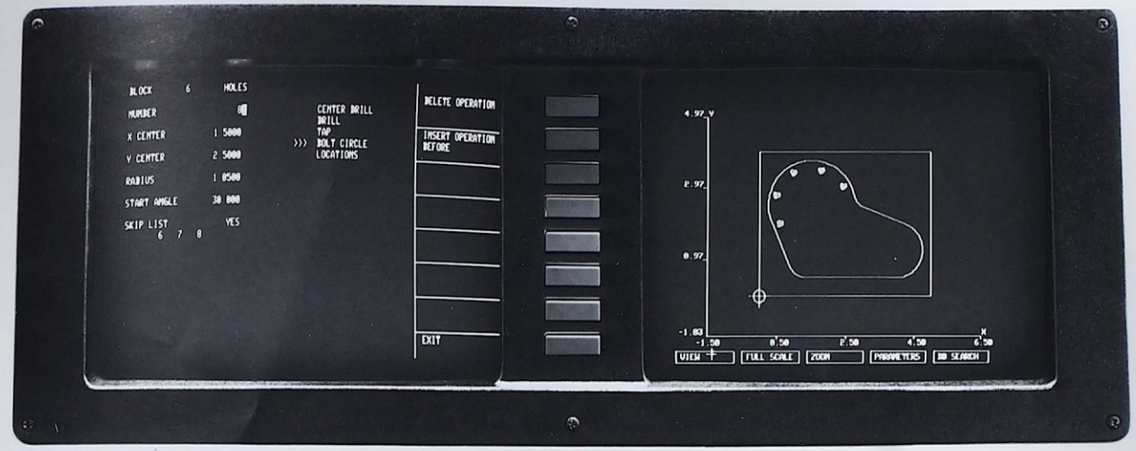
In conventional programming, this would have required 42 complete data blocks. Ultimax required only one, and a total of five screens of information.

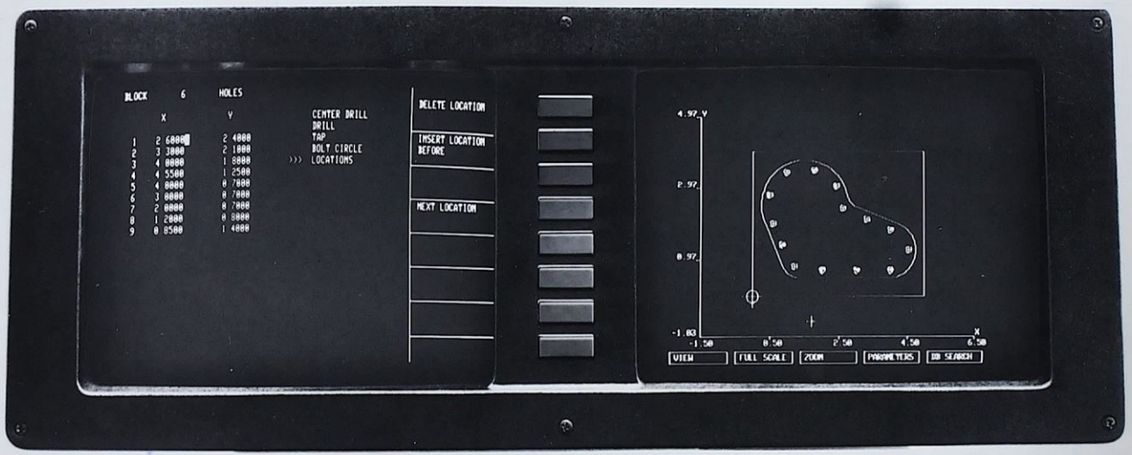
Other hole subroutines include countersink, counterbore, ream and spot face.

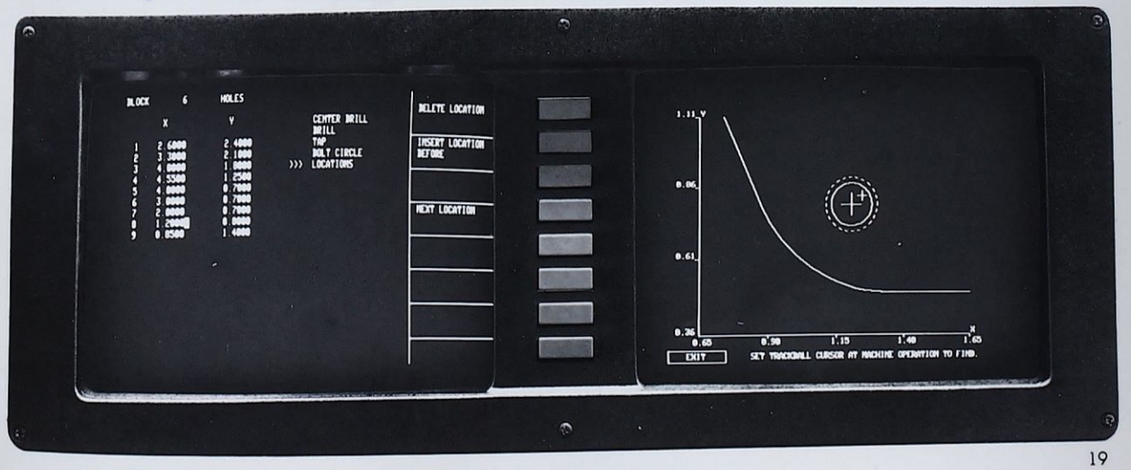


During programming, graphic parameters can be selected and changed using the menu as shown on the right hand screen.









Milling Pattern in Three.

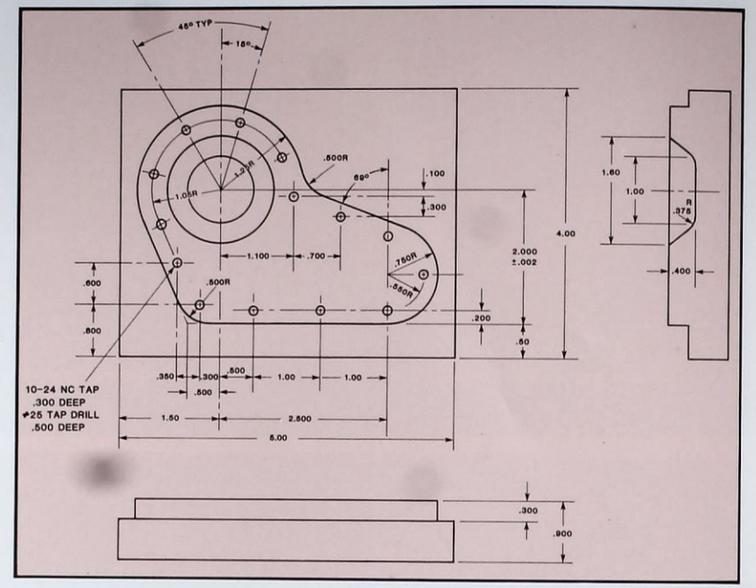
Conventional CNC programming would have required the use of over 500 data blocks to accomplish the milling pattern shown. Ultimax handled the same task using only three.

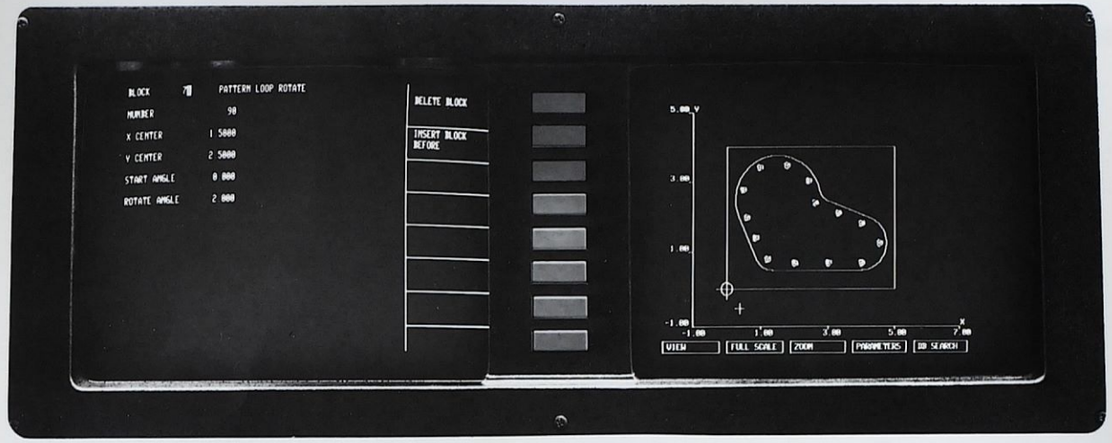
The conical type of depression milled in the center of the large round end of the bellcrank required contour machining with all three axes simultaneously, using a ball-nose endmill.

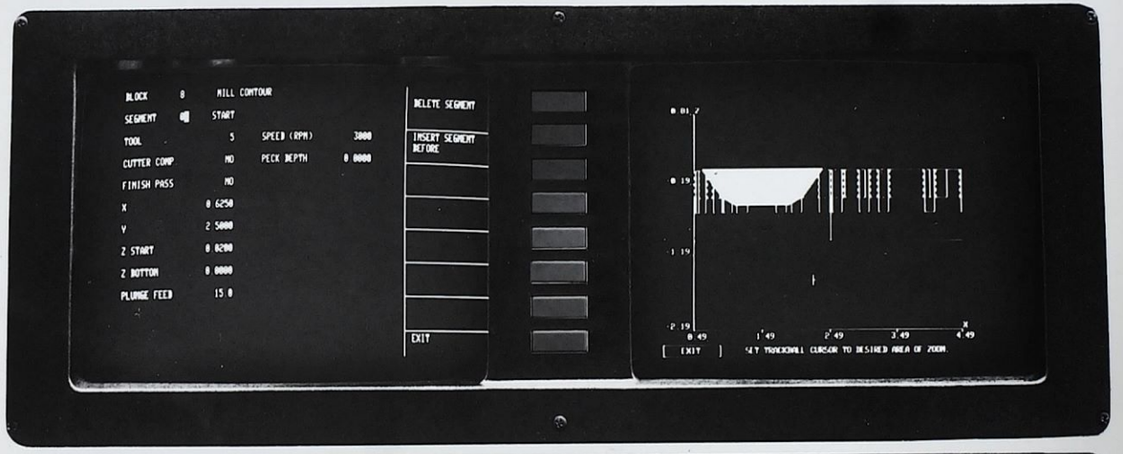
The first data block established that a pattern involving rotation of a defined contour was initiated. It also defined the number of times the subsequent pattern was to be rotated and the angular degree for each rotation.

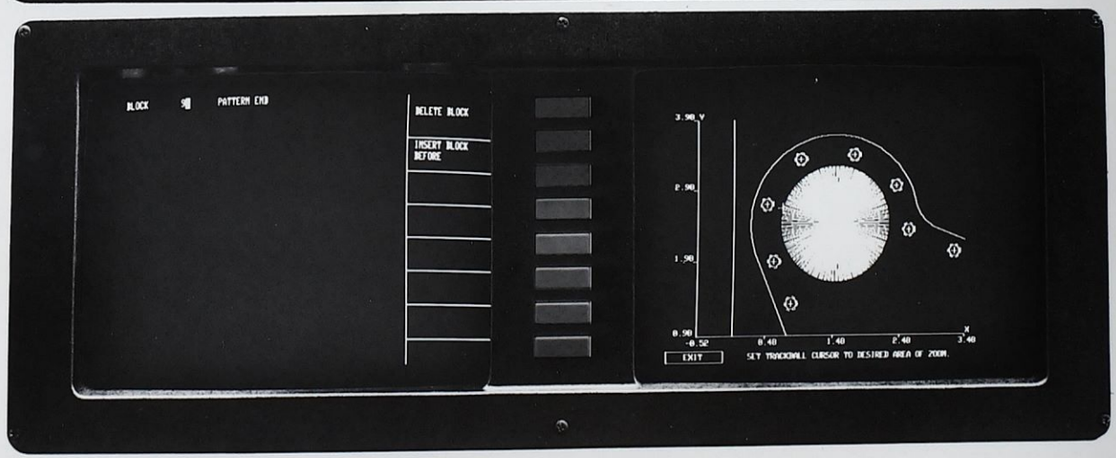
The second data block was a standard mill block, using the line and arc sub-routine in the XZ direction. The third data block merely specified the end of the pattern.

In total, this pattern sequence required three data blocks and eight screens of information to mill a contour in the XZ direction and rotate it 90 times in 2° increments. The cross section of the milled pocket was verified using an edge view in the graphics. The zoom feature was utilized to magnify the part adjacent to the dimensional scale.

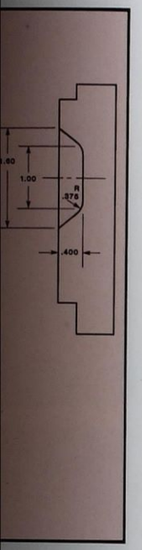








hree. Ultimax Specifications.



Subroutines:

- circle milling
- face milling
- frame milling
- ellipse milling
- pocket milling
- odd pocket milling
- automatic rough pass/finish pass machining cycles
- helical interpolation
- automatic arc blending
- angular repeat of patterns
- rectangular repeat of patterns
- random repeat of patterns
- angular translations of patterns
- rotation of patterns
- mirror image
- scaling in x, y and z
- bolt circle
- peck drilling
- chipbreaker drilling
- dwell drilling for blind holes
- boring subroutines: standard, bore orient, rapid retract
- tapping
- automatic computer calculation of unknown coordinates

Software Features:

- 4 axis simultaneous positioning
- 3 axis linear interpolation
- 3 axis circular interpolation
- cutter compensation
- tool length correction
- tool radius correction
- 99 tools maximum storage per program
- user programmable subroutine parameters
- cartesian and polar coordinate programming
- inch or metric programming
- computer programmed feedrates and spindle speeds
- full floating part zero (datum point)
- multiple part zero's per program
- machine velocity error monitor
- axis load monitor
- axis reversal error compensation
- ballscrew error compensation
- programmable safety zone
- programmable rapid traverse rate
- parts counter
- tool and material libraries
- programmable coolant control
- concurrent programming (simultaneous machining of one part while programming another)
- oil pressure warning

Operating Modes:

- Input Mode, for program data entry, tool and part calibration, and graphics
- Review Mode, for program verification
- Auxiliary Mode, for program storage & retrieval, use of external communication ports (RS232C)
- Manual Mode, for jogging individual axes (digital read out), and set up
- Test Mode, for generating test run of program without actual cutting, and generating computer estimate of total run time for a program
- Help Mode, for use in conjunction with other modes to clarify and define individual operating and programming requirements

Front Panel and Machine Control:

- Two 12" CRT screens, 24 lines X 80 columns, 308 x 412 pixels
- Manual jog wheel with adjustable resolution
- Feedrate override potentiometer
- Spindle RPM override potentiometer
- Trackball cursor controller for graphics screen
- DC100 read/write magnetic tape data cassette system for program storage and executive software, 9600 Baud data transfer rate
- Program key lock switch disabling access to control memory
- Calculator function keyboard (+, −, ÷, ×)
- 8 Multifunction soft keys
- RIM molded control head, swivel mounted, dust tight construction
- Two RS232C input/output ports for serial data communication. Accepts NC data RS274D, EIA codes RS-358

System Descriptions:

- One central microprocessor with math co-processor operating at 5 MHz
- Four navigation microprocessors, one for each axis control
- Two controller microprocessors for video, front panel, text, and cassette operations
- One graphics microprocessor
- 512K expandable to one megabyte (1000K) of static RAM memory
- Battery back-up for RAM: 72 hours (3 days) minimum
- Ambient temperature for control system (humidity to 95% non-condensing):
  Operation: 32°F to 100°F (0°C to 38°C)
  Storage: −20°F to 160°F (−30°C to 70°C)
- Mounting Height (to center of keyboard): 42½" (1080mm)

Hardware and Performance Specifications:

- Programming Resolution (Linear): .0001" (.001mm)
- Programming Resolution (Rotary): .001 degree
- Rapid Traverse Rate: 400 ipm (10m per min)
- Programmable Feedrate: .1 to 100 inches per minute (1 to 2,500mm per minute)

Hurco: The Leader

Hurco Manufacturing Company

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Indianapolis, Indiana 46268
1-800-428-3601

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HSE 564 3/86

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Printed in U.K.